

Rebuttal Report

to

"Expert Report Regarding "Former Union Pacific Railroad Yard: Imminent and Substantial Endangerment to the Environment" by Dr. Steven G. Ellis, Geomatrix Consultants, Inc. (No Date)

and

Expert Witness Report of Susan M. Gallardo, PE, January 29, 2008

Prepared by

William J. Rogers, Ph.D.

February 28, 2008

I. Introduction

This report, along with the figures, tables and photos contained herein may be used as exhibits.

I have been retained by Humboldt Baykeeper and Ecological Rights Foundation to prepare this Expert Report in response to "Former Union Pacific Railroad Yard: Imminent and Substantial Endangerment to the Environment" by Dr. Steven G. Ellis, Geomatrix Consultants, Inc., and "Expert Witness Report of Susan M. Gallardo, PE, January 29, 2008".

In order to perform this evaluation I reviewed the Reports of Dr. Steven G. Ellis and Susan M. Gallardo, PE, as well as the reports and documents presented in my January 2008 *Potential and Likely On-Site and Off-Site Environmental Risks from Chemicals found at the Balloon Track, Eureka, California* ("Expert Report"). A list of additional documents that have been provided to me after submission of my Expert Report and/or were used in the preparation of this report is attached in Section IV.

My qualifications, along with a list of my publications from the past ten years, a list of my testimony at deposition and trial during the last four years, and compensation are contained in my January 2008 Expert Report and in my curriculum vitae attached as Exhibit A to that Report.

I respond to the report by Dr. Ellis in Section II. I respond to the report by Susan Gallardo in Section III. Attached in Section IV are appendices that provide data and references providing support for my opinions.

II. Rebuttal to "Expert Report Regarding "Former Union Pacific Railroad Yard: Imminent and Substantial Endangerment to the Environment" by Dr. Steven G. Ellis, Geomatrix Consultants, Inc.

Opinion a: Dr. Ellis (page 4/14) states that, "The ditches in these areas generally contain standing water during wet weather periods and it is my understanding that they dry up during dry conditions. Furthermore, it is my understanding that the amount of water, if any, that ultimately reaches Clark Slough from these ditches has not been established."

Response to Opinion a: On my visit to the site, after a previous nights rainstorm, it was obvious that water was leaving the site and entering the ditches that ultimately enter Clark Slough. Dr. Ellis does not provide information on the vegetation and soils in the ditch that would indicate the duration of the standing water at the site. During my site visit, the mid-to-lower portion of the ditch had a lush stand of hydric vegetation indicating wetland conditions.

Opinion b: Dr. Ellis (page 4/14) states that "It is my understanding that fish and aquatic invertebrates do not move into these ditches when they contain water".

Response to Opinion b: Dr. Ellis does not provide any reference for this assertion and completely avoids acknowledging the value of intermittent wetlands. Freshwater wetlands, such as those found on site, are not dependent upon migration of organisms from Clark Slough to populate the newly formed habitat. An entire ecosystem exists in these wetlands and that system is quite capable of populating the newly formed habitat within hours and days of inundations. The presence of hydric plants and soils indicate the presence of water for periods long enough to support a wetland habitat, freshwater benthic communities and associated wildlife. Numerous pacific tree frogs were observed in the freshwater wetlands.

Opinion c: Dr. Ellis (page 5/14) states that, "Once site stormwater discharge reaches Clark Slough the water will be diluted as it mixes with slough water."

Response to Opinion c: Dr. Ellis's reliance on "dilution" ignores the presence and accumulation of contaminated sediments in the ditches onsite and in Clark Slough, with particularly high levels of contaminants such as metals, dioxins and furans found where the site (Station D) discharges. It also ignores the impacts to on-site receptors. Further, even for dissolved contaminants in water leaving the site, it is my opinion that dilution is neither appropriate or allowed under the California Toxics Rule, which is discussed further below.

Opinion d: Dr. Ellis (page 5/14) states, "The aquatic life residing in Clark Slough is the environmental receptors that have the greatest exposure to site stormwater contaminants."

Response to Opinion d: This statement is unfounded and is incorrect. The on-site receptors, such as those in the wetlands and ditches on the site, as well as terrestrial and avian species in upper trophic levels, will be as exposed, if not more exposed, to the site contaminants. Again, Dr. Ellis fails to recognize or acknowledge the significant ecological value of the wetlands and upland habitats found on the site and the species that occupy and use those habitats, and fails to consider impacts from contaminated soils and sediments.

Opinion e: Dr. Ellis (page 5/14) states, "The large dilution of Clark slough waters once they are discharged to Humboldt Bay indicates potential impacts are unlikely."

Response to Opinion e: This statement is unfounded and not supported by any evaluation of the data. Dr. Ellis has not calculated the volume of water being discharged, and as such, cannot calculate how much dilution is taking place. Additionally, Clark Slough is a complex, tidally-influenced waterbody where contaminant levels may vary during tidal cycles. Dilution in Clark Slough will in no way have a positive impact on the freshwater wetlands receptors that are exposed to the contaminated water and contaminated sediments found on the site. The data collected by the author's own company illustrates that the contaminant levels exceed environmental screening criteria

and protective levels. These exceedances are discussed in more detail in subsequent sections of this report.

Opinion f: Dr. Ellis (page 6/14) states, "If site stormwater concentrations of metals are below the CMC and CCC criteria there is no endangerment of aquatic life."

Response to Opinion f: This statement ignores the fact that there are multiple contaminants of concern and pathways at this site that have potential additive, synergistic and potentiating effects.

Opinion g: Dr. Ellis (page 6/14) states that, "However, if concentrations are occasionally above these criteria it does not necessarily indicate endangerment."

Response to Opinion g: Dr. Ellis has failed to note that excursions above the CCC and CMC levels are specified in the California Toxic Rule (CTR) which states: "Based on available data, today's rule requires that the acute criterion for a pollutant be exceeded no more than once in three years on the average. EPA is also requiring that the chronic criterion for a pollutant be exceeded no more than once in three years on the average." 40 CFR Part 131, 31702 Paragraph (d). The data indicates that excursions have exceeded the allowed excursion limit on numerous occasions. These excursions are addressed under the following pollutant specific discussions.

Opinion h: Dr. Ellis (page 6/14) states, "The next step in the evaluation of endangerment was to consider the potential dilution of site stormwater in Clark Slough in cases where concentrations were elevated above screening criteria." Because stormwater is diluted as it enters Clark Slough, the actual concentration aquatic life is exposed to would be lower than the undiluted site stormwater value."

Response to Opinion h: Dr. Ellis's approach ignores impacts to the wetlands and on-site receptors. In addition to my responses above regarding dilution in Clark Slough, the CTR specifically states when a mixing zone or dilution can be used. Page 31717 paragraph (c) (2) (i). "For all waters with mixing zone regulations or implementation procedures, the criteria apply at the appropriate locations within or at the boundary of the mixing zones; otherwise the criteria apply throughout the water body including at the point of discharge into the water body." Since a "mixing zone" has not been established consideration of dilution in Humboldt Bay or Clark Slough is not allowed. The comparison of contaminant concentration with water quality objectives and other measures of environmental endangerment should be at, or upstream of, the discharge point from the site as it enters into Clark Slough.

Opinion i: Dr. Ellis states (page 6/14), "This is clearly the case, when comparing values to the CCC criteria as this is a four day average criterion. Over a four day period, water is repeatedly flushed out of the slough and a single measurement in stormwater would not represent this exposure period."

Response to Opinion i: As stated above the CTR specifies dilution can only be used if a "mixing zone" has been established. Dr. Ellis acknowledges that discharge measurements were not calculated even though water flow measurements were taken. Dr. Ellis does not provide data to support the proposed duration and intensity of flushing nor is it allowed under the CTR.

Opinion j: Dr. Ellis (page 6/14) acknowledges the February 2007 EPA published revised guidance for copper (FR February 22, 2007 [(Volume 72, Number 35) (pages 7983-7985)] which recommends use of the "biotic ligand model (BLM)" to update copper freshwater criteria. Dr. Ellis acknowledges that the model requires data such as temperature, pH, dissolved organic carbon (DOC), humic acid content, major cation concentrations (calcium, magnesium, sodium, and potassium), major anions (sulfate and chloride), alkalinity, and sulfide. Dr. Ellis then states, "Information on all of these parameters is not available for the Balloon track site so the model cannot directly be used to evaluate copper toxicity. The BLM was used qualitatively in making a determination of endangerment from copper by considering the parameters that influence the model's prediction of toxicity."

Response to Opinion j: Dr. Ellis has based his entire assessment of endangerment on impacts to Clark Slough which is saline/brackish. In (FR February 22, 2007 [(Volume 72, Number 35) (pages 7983-7985)] on page 7985 the EPA states, "EPA has since determined that the biotic ligand model requires further development before it is suitable for use to evaluate saltwater data." As stated the BLM is not an appropriate model for use in support of Dr. Ellis's position. Secondly, Dr. Ellis does not state how the model was used "qualitatively". I do not know of any established procedures to use the BLM qualitatively. Dr. Ellis did not provide any guidance on the method used or any values derived from the proposed method to support his position.

Opinion k: Dr. Ellis (page 7/14) states that data from sampling station D was excluded from evaluation because "meter conductivity reading (recorded as 3626 μ S/cm) indicated the water being sampled was slough water rather than stormwater."

Response to Opinion k: This statement is in conflict with the statement made by Dr. Ellis in which states that, "It is my understanding that fish and aquatic invertebrates do not move into these ditches when they contain water". Station D lies at the lower end of the western ditch just above the outfall into Clark Slough. If Clark Slough water is entering the ditch then organisms can also enter the ditch and can then be exposed to the pollutants found in the ditch. Additionally, whether the Slough water was entering the ditch at Station D is irrelevant to the purpose of collecting data on pollutant levels being discharged at Station D, and thus regardless of the salinity reading the sample should not have been disregarded.

Zinc

Opinion l: Dr. Ellis (page 8/14) states, "Monitoring data collected subsequent to soil removal actions at the Balloon track site at the three locations described as freshwater

wetlands (station A, B, and F located on the east side of the site and the ditch intersecting Clark Slough (Station D) show that dissolved zinc concentrations have never exceeded the EPA freshwater or saltwater CMC or CCC criteria that are intended to protect organisms and their uses from unacceptable effects due to exposure."

Response to Opinion l: Dr. Ellis does not state whether he is using the total recoverable metals or the dissolved metals that were filtered. Filtering was not allowed in the RWQCB Monitoring and Reporting Program No. RI-2001-29 (Item 8) following EPA Guidance (EPA, 1992, EPA 1993). Considering the EPA recommended calculated dissolved metal fraction and adjustment for hardness Tables 2,3,4 and 5), Station A exceeded the Water Quality Objective (WQO) CCC and CMC on 12/17/2001, 1/13/2003, and 2/2/2004. On the 2/2/2004 sampling event the Zinc concentrations exceeded both the CCC and CMC WQO by nearly 3.6 times. There have been several recorded exceedances of the CCC and CMC at Station B,. Station F exceeded both the CCC and CMC WQO on eight sampling events, with concentrations exceeding the CCC and CMC WQO up to four times, and, as recently as 1/9/2004,.

In addition, rainfall event data quality is dependant upon the time samples are taken in relationship to the rainfall and subsequent flushing event. At first glance, it appears that the excursions are much less frequent in later years, however, the sampling frequency was also dramatically reduced in 2006 and 2007.

Dr. Ellis has based his conclusion solely on the risk posed by "stormwater" to Clark Slough. Based on the excursions above the CCCs and CMCs, the lack of adequate site characterization to delineate the site, lack of consideration of on-site freshwater wetlands and ecological receptors, lack of consideration of onsite concentrations of zinc in sediments (for example, on July 30, 2007, Plaintiffs' sediment sample at Site S-4 exceeded the NOAA Squirts UET by nearly two fold), Dr. Ellis cannot support his conclusion that the site does not constitute an imminent and substantial harm to the environment.

Lead

Opinion m: Dr. Ellis states (page 8/14), "Monitoring data collected subsequent to soil removal actions conducted at the site at the three sites described as freshwater wetlands (Stations A, B, and F) located on the east side of the site and the ditch intersecting Clark Slough (Station D) show that dissolved lead has not been detected since February 28, 2005.

Response to Opinion m: This statement is unsupported. Lead has been detected on numerous occasions since February 28, 2005 on many occasions at levels well above the CCC.

Dr. Ellis has based his conclusion solely on the risk posed by "stormwater" to Clark Slough. Based on the excursions above the CCC, the lack of adequate site characterization to delineate the site, lack of consideration of on-site freshwater wetlands

and ecological receptors, and lack of consideration of onsite concentrations of lead in sediments, Dr. Ellis cannot support his conclusion that the site does not constitute an imminent and substantial harm to the environment.

Copper

Opinion n and Response to Opinion n: Dr. Ellis's summary of the copper excursions above the CCC and CMCs is not correct. Dr. Ellis states that the freshwater criteria for Station A was exceeded in 2004 however, CCC and CMCs were exceeded in all years from 2001 to 2007 at Station A and B (except Station B in 2007). At Station F, the CCC was exceeded in 2005. At Station D, the CCC and CMCs were exceeded in 2002 through 2007.

Opinion o: Dr. Ellis states that the pH range was from 6.2 to 7.4 but does not provide a range of pH values for the freshwater wetlands, or values prior to, or after, the stormwater events in Clark Slough. Dr. Ellis states, "Therefore pH would be expected to increase and copper toxicity decline as site stormwater mixes with Clark Slough water and incoming seawater."

Response to Opinion o: The timing of sampling, the buffering potential of the watercourse and sediments, the discharge volumes all affect the pH level and duration of pH levels. Dr. Ellis does not provide the information and data needed to support his conclusion.

Opinion p: Dr. Ellis states (page 10/14) that DOC concentrations are unknown but then states, "however, the presence of vegetation and brownish water color observed in the site photographs suggests DOC is likely to be elevated in site stormwater and in the slough. Thus is expected that DOC concentrations in Clark Slough would act to reduce copper toxicity."

Response to Opinion p: Dr. Ellis states that DOC was not analyzed but confidently states that based on visual observations the DOC levels are adequate to reduce copper toxicity. I do not believe there is an accepted method of correlating water color to DOC concentrations. DOC measurements must be taken before this statement can be supported.

Opinion q: Dr. Ellis states, (page 10/14) "The amount of flow from the east ditches to the slough, if any, has not been established. If no flow reaches Clark Slough, copper concentrations in the site stormwater from these ditches pose no endangerment to aquatic life in the slough. On dates when dissolved copper exceeds the previous EPA CMC criterion, site stormwater dilution factors of slightly greater than 1 to 8 would be needed to reach the criterion. Dilution factors of 1 to 10 would be required to reach the CCC criterion."

Response to Opinion q: Dr. Ellis acknowledges that flow has not been established and as such his assumption about risk based on flow not reaching the slough is without

foundation. Dr. Ellis has not provided the concentration data required to support his assumptions regarding dilution. As stated previously, since a mixing zone has not been established, the effects must be assumed at the point of discharge. Since discharge volume has not been determined, estimates of dilution volumes and factors cannot be supported or evaluated. In addition he ignores impacts to onsite freshwater wetlands.

Opinion r: Dr. Ellis states (page 10/14), "The reduction of copper toxicity suggested by the qualitative consideration of the BLM and the low stormwater flow rates measured in east side ditches relative to flows measured in Clark Slough indicates that copper in site stormwater from the ditches does not constitute an imminent and substantial harm to the environment."

Response to Opinion r: I know of no accepted method or approach to use a "qualitative consideration of the BLM". Dr. Ellis states that the data required to run the "Biotic Ligand Model" was not collected. Dr. Ellis did not provide a method or the parameters used to apply this qualitative assessment. Dr. Ellis acknowledges that "site discharge measurements have not been established". The point in time flow rates cannot be used as any indication of discharge and as such, the presumption of significant dilution cannot be supported. Dr. Ellis's assumptions about the BLM and dilution factors cannot support his conclusion that "copper from site stormwater in the ditches does not constitute an imminent and substantial harm to the environment".

Opinion s: Dr. Ellis states (page 10/14), "Copper has been detected on 4 of the 13 valid rainfall monitoring events conducted at Station D from December 29, 2003 to April 12, 2007. Elevated concentrations above the previous EPA CMC criterion were detected on December 29, 2003 and December 21, 2006."

Response to Opinion s: This statement is incorrect. Dr. Ellis has not defined a "valid" rainfall event. Based on my review of the data copper has been detected at Station D 8 times, and the CMC has been exceeded on 6 occasions during the specified time period. Between 11/21/2006 and 2/21/2007 all three consecutive rainfall monitoring events had copper concentrations that exceeded the CMC. On one of those occasions, the CMC was exceeded by 27 times. Exceedances of CMC more than once in a three-year time span does not allow the ecosystem to recover. The frequency of the copper concentration level excursions above the CMC and the magnitude of those excursions clearly indicates that the site poses an imminent and substantial harm to the environment.

Based on the lack of adequate site characterization to delineate the site, lack of consideration of on-site freshwater wetlands and ecological receptors, lack of consideration of onsite concentrations of copper in sediments Dr. Ellis cannot support his conclusion that the site does not constitute an imminent and substantial harm to the environment.

Opinion t: Dr. Ellis references surveys conducted by H.T. Harvey & Associates as indicating that "The presence of fish and invertebrates in the slough demonstrate that

discharges from the site are not acutely toxic to these species and that copper entering the slough does not constitute an imminent endangerment to the slough environment."

Response to Opinion t: Dr. Ellis cannot support this statement without first establishing the expected populations of these species in a background, or uncontaminated, slough. These counts could represent drastically reduced populations. The mere presence of species does not prove a healthful environment. The referenced species all have the ability to migrate into the slough from the less contaminated Humboldt Bay and to reoccupy the area. Dr. Ellis does not mention the risk of bioaccumulation of contaminants and potential impact to higher trophic levels. He also does not address the potential impact to benthic organisms in the slough needed to support the estuarine ecosystem.

Tissue samples collected on 1/10/2008 found TCDD Dioxin/Furan equivalent concentrations in the Sculpins (Cottus asper) at 2.635 pg/g H/M 2.304 pg/g Fish TEQ and in (Leptocottus armatus) at 4.288 pg/g H/M 3.52 pg/g Fish TEQ.¹ These tissue values are among the highest found in Humboldt Bay, exceeding the highest tissue concentration found in fish tissues by Geomatrix (2004) of 1.28 pg/g, and are close to the highest tissue result found in an Oyster at 4.31pg/g. The Clark Slough sculpin samples are from 9 to 14 times the OEHHA screening level of 0.3 nanograms/kg (or 0.3 pg/g or ppt) used for the Humboldt Bay listing in the 2006 section 303 (d) Clean Water Act list of water quality limited segments for California.

Sediment samples collected before, or upstream of the railroad culvert revealed TCDD equivalent levels of 1,027.44 pg/g (Sed 2 sample) and samples at S-5 just above the railroad culvert and draining into the area sampled at Sed 2 were found to be 607.6 pg/g. These values are 170 times the highest TCDD TEQs (6.03 pg/g) found in the 55 sediment cores from 11 Eureka Waterfront moorage facilities in the Bay near the mouth of Clark Slough (City of Eureka, 2005). As stated in my January 2008 report, TCDD equivalent concentrations were found at elevated concentrations throughout the site, and at locations that could not be influenced by Clark Slough.

During the sampling event on January 10, 2008, I observed water flowing from north to south in the west ditch and entering Clark Slough at Station D. This observation, as well as the observed levels of TCDD equivalents at locations across the site indicate that TCDD contamination is moving from the site into Clark slough. The extremely elevated levels of dioxin-like contaminants in Balloon Track sediments provide a significant source of contaminants to Clark Slough and Humboldt Bay.

Considering the potential for bioconcentration of dioxins and furans from sediments to invertebrates and biomagnification up the food chain (potentially >500,000 times) the site poses a significant potential for exposure to even the most transient of high level predators in Clark Slough. Arsenic is also accumulating in Clark Slough fish tissue. It was found in elevated levels in sculpins tissue (.24 mg/kg and .34 mg/kg). Copper was found at 1.6 and 1.3 mg/kg in Clark Slough sculpin tissue.

¹ Samples adjusted to "fish TEQs" following the methodology used in my January 2008 report.

Use of vertebrates and invertebrate occurrence to measure the health of a habitat does not consider such impacts as the copper and arsenic impacts to freshwater and estuarine plant growth and carrying capacity of the both habitats. Dr. Ellis cannot support his statement that the site, "does not demonstrate endangerment to the environment. To the contrary, the evidence of bioaccumulation of these highly toxic substances indicates there is a very significant risk to the environment at this site.

General Response to Dr. Ellis's Determination of Substantial Endangerment

Dr. Ellis's "determination of substantial endangerment to the environment" was based exclusively on dissolved concentrations of metals. (p. 5/14) It is my opinion that Dr. Ellis's failure to assess the significant risks posed from other known sources and contaminants, such as dioxin concentrations in onsite wetlands and Clark Slough sediments, is fatal to his conclusions. It is my opinion that in estimating the risks based on exposure to those contaminated sediments, unacceptable Hazard Quotients (HQs) would result.

For example, this approach was used by Geomatrix in the Scoping Ecological and Off-Site Human Health Risk Assessment, Sierra Pacific Industries Arcata Division Sawmill, September 8, 2004. (Geomatrix 2004). Geomatrix 2004 reported mean and 95% UCL concentrations for TCDD TEQ in Humboldt Bay surface sediments at 2.63 and 3.28 nanograms/kilogram (ppt) respectively. This resulted in hazard quotients (HQ) of 3.1 and 3.9 for benthic invertebrates and fish based on sediment toxicity reference values. Mad River Slough surface sediments had mean and 95% UCL concentrations of 7.64 and 13.6 ng/kg resulting in HQs of 9.0 and 16 respectively.

The HQ is used to express the risk posed by a site contaminants to the environment/ecological receptors. The HQ is expressed as the exposure concentration, typically the 95% UCL of the site contaminants, divided by the Toxic Reference Value (TRV). The TRV is typically a receptor-specific or indicator species or indicator group toxicity value (dose or exposure concentration) that results in a negative response. If the hazard quotient is less than 1.0 the exposure is less than the TRV and the potential for adverse effect is unlikely. If the HQ is equal to 1 or more there is a potential for adverse effects (EPA, 1997). The higher the HQ, the higher the risk of adverse effect.

TCDD TEQ levels at Clark Slough were found at a high of 1,027 pg/g (ppt) Human and mammal (H/M), which converts to 826.39 pg/g Fish TEQ, to a low of 20.781 pg/g H/M, which converts to 16.65 Fish TEQ. Comparing the Clark Slough TCDD levels to the Humboldt Bay levels found in the Sierra Pacific Study, the HQ for benthic invertebrates and fish in Clark Slough would be expected to be orders of magnitude higher.

The Geomatic risk assessment (Geomatrix, 2004), based primarily on TCDD, resulted in an overall HQ in excess of 1 but argued that because the TCDD contaminants were at depth the risk would be less and acceptable. The Clark Slough samples were taken in the upper 6" level and represent those sediments with the greatest potential for benthic

invertebrate and fish contact. Considering the extremely high concentrations of TCDD TEQ on the Balloon Track Site and in Clark Slough, those concentrations pose a significant and long term source of TCDD to Humboldt Bay.

Opinion u: Dr. Ellis states, "Imminent and substantial endangerment to the environment requires a demonstration that there is a serious cause for concern the environment will be harmed if remedial action is not taken. Monitoring data collected for December 29, 2003 to April 12, 2007 within the Balloon Track site, in freshwater wetlands and in Clark Slough, does not demonstrate substantial endangerment to the environment."

Response to Opinion u:

- (1) Dr. Ellis has not considered the impact of contaminants on the freshwater wetlands and upland habitats.
- (2) water samples exceed both CCC and CMC criteria for water samples for copper, lead and zinc.
- (3) Excursions of the CCC and CMC exceed the maximum number of, "no more than one in three years" for those contaminants and therefore do not allow time for the ecosystem to recover.
- (4) Dr. Ellis acknowledges that discharge volume data is not available but then supports his conclusion of no demonstrated substantial endangerment with arbitrary discharges and dilution factors. Dr. Ellis uses flow rate as a measure of discharge which he acknowledges was not collected nor calculated.
- (5) Dr. Ellis inappropriately applies dilution factors to diminish the impacts of contaminants at the site. No mixing zone has been established for the site.
- (6) Dr. Ellis has not considered the impacts from bioconcentration, bioaccumulation and biomagnification in the terrestrial, freshwater wetland and estuarine habitats found at the site including impacts from highly toxic COCs such as dioxins, furans and PCBs.

III. Rebuttal to "Expert Witness Report of Susan M. Gallardo, PE, January 29, 2008"

Opinions of Ms. Gallardo: Ms. Gallardo states the opinions that "[s]ites where soil and groundwater are affected by petroleum hydrocarbons and metals are common, and the Balloon Track is typical for these types of sites"; that [p]etroleum and petroleum-related constituents and metals are the primary chemical impacts from the historic operations at the Balloon Track; and that "[t]he mitigation response to the chemical impacts at the site was reasonable and typical".

Response to Ms. Gallardo's Opinions:

The Balloon Track site is not a typical petroleum-impacted site. The site is also contaminated with dioxins, furans and PCBs, which are considerably more toxic than hydrocarbons. The site is located adjacent to, and on a tidally-influenced slough of Humboldt Bay, which is on the list of impaired water bodies due to bioaccumulation of dioxins and furans in Bay fish and shellfish

Tissue samples collected on 1/10/2008 found TCDD Dioxin/Furan equivalent concentrations in the Sculpins (*Cottus asper*) at 2.635 pg/g H/M 2.304 pg/g Fish TEQ and in (*Leptocottus armatus*) at 4.288 pg/g H/M 3.52 pg/g Fish TEQ.² These tissue values are among the highest found in Humboldt Bay, exceeding the highest tissue concentration found in fish tissues by Geomatrix (2004) of 1.28 pg/g, and are close to the highest tissue result found in an Oyster at 4.31pg/g. The Clark Slough sculpin samples are from 9 to 14 times the OEHHHA screening level of 0.3 nanograms/kg (or 0.3 pg/g or ppt) used for the Humboldt Bay listing in the 2006 section 303 (d) Clean Water Act list of water quality limited segments for California.

Sediment samples collected before, or upstream of the railroad culvert revealed TCDD equivalent levels of 1,027.44 pg/g (Sed 2 sample) and samples at S-5 just above the railroad culvert and draining into the area sampled at Sed 2 were found to be in excess of 500 pg/g. These values are 170 times the highest TCDD TEQs (6.03 pg/g) found in the 55 sediment cores from 11 Eureka Waterfront moorage facilities in the Bay near the mouth of Clark Slough (City of Eureka, 2005). As stated in my January 2008 report, TCDD equivalent concentrations were found at elevated concentrations throughout the site, and at locations that could not be influenced by Clark Slough. The extremely elevated levels of dioxin-like contaminants in Balloon Track sediments provide a significant source of contaminants to Clark Slough and Humboldt Bay.

Considering the potential for bioconcentration of dioxins and furans from sediments to invertebrates and biomagnification up the food chain (potentially >500,000 times) the site poses a significant potential for exposure to even the most transient of high level predators in Clark Slough

It is my opinion that the mitigation response has failed to estimate the risks based on exposure to contaminated sediments, and that unacceptable Hazard Quotients (HQs) would result from such an estimation.

For example, this approach was used by Geomatrix in the Scoping Ecological and Off-Site Human Health Risk Assessment, Sierra Pacific Industries Arcata Division Sawmill, September 8, 2004. (Geomatrix 2004). Geomatrix 2004 reported mean and 95% UCL concentrations for TCDD TEQ in Humboldt Bay surface sediments at 2.63 and 3.28 nanograms/kilogram (ppt) respectively. This resulted in hazard quotients (HQ) of 3.1 and 3.9 for benthic invertebrates and fish based on sediment toxicity reference values. Mad River Slough surface sediments had mean and 95% UCL concentrations of 7.64 and 13.6 ng/kg resulting in HQs of 9.0 and 16 respectively.

The HQ is used to express the risk posed by a site contaminants to the environment/ecological receptors. The HQ is expressed as the exposure concentration, typically the 95% UCL of the site contaminants, divided by the Toxic Reference Value (TRV). The TRV is typically a receptor-specific or indicator species or indicator group toxicity value (dose or exposure concentration) that results in a negative response. If the

² Samples adjusted to "fish TEQs" following the methodology used in my January 2008 report.

hazard quotient is less than 1.0 the exposure is less than the TRV and the potential for adverse effect is unlikely. If the HQ is equal to 1 or more there is a potential for adverse effects (EPA, 1997). The higher the HQ, the higher the risk of adverse effect.

TCDD TEQ levels at Clark Slough were found at a high of 1,027 pg/g (ppt) Human and mammal (H/M), which converts to 826.39 pg/g Fish TEQ, to a low of 20.781 pg/g H/M, which converts to 16.65 Fish TEQ. Comparing the Clark Slough TCDD levels to the Humboldt Bay levels found in the Sierra Pacific Study, the HQ for benthic invertebrates and fish in Clark Slough would be expected to be orders of magnitude higher.

The Geomatic risk assessment (Geomatrix, 2004), based primarily on TCDD, resulted in an overall HQ in excess of 1 but argued that because the TCDD contaminants were at depth the risk would be less and acceptable. The Clark Slough samples were taken in the upper 6" level and represent those sediments with the greatest potential for benthic invertebrate and fish contact. Considering the extremely high concentrations of TCDD TEQ on the Balloon Track Site and in Clark Slough, those concentrations pose a significant and long term source of TCDD to Humboldt Bay.

Submitted under penalty of perjury, this 28th day of February, 2008.

A handwritten signature in cursive script, reading "William J. Rogers".

William J. Rogers PhD, CHMM

IV. Tables and References

List of Tables

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CEA Table 5, Analytical Results Summary-Surface Water Station F
CEA Table 7, Analytical Results Summary – Sediment, July 12, 2000 Sampling Event

RAM Table 3, Fish Data Collected January 10, 2008
RAM Table 6(b), Analytical Results Summary – Sediments July 30, 2007, Sampling
Event, CEA No. 07040
RAM Table 7, Sediment Data Collected January 2008

Table 2
Analytical Results Summary - Surface Water
Station A
Revised February 22, 2008
CEA No. 07040

LOCATION	DATE	ARSENIC (total) ug/l	COPPER (total) ug/l	COPPER (total) ug/l	COPPER (total) ug/l	LEAD (total) ug/l	LEAD (total) ug/l	LEAD (total) ug/l	ZINC (total) ug/l	ZINC (total) ug/l	ZINC (total) ug/l
Data Compared to:		CCC 150 ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽¹⁾	Freshwater CMC at Noted Hardness ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽¹⁾	Freshwater CMC at Noted Hardness ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽¹⁾	Freshwater CMC at Noted Hardness ug/l
A	11/28/2001	<5	17	17	17	<15	<15	<15	55	55	55
A	12/17/2001	6.5	18	18	18	9.4	9.4	9.4	72	72	72
A	1/8/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A	2/7/2002	1.9	8.8	8.8	8.8	7.4	7.4	7.4	27	27	27
A	12/19/2002	5.7	23	23	23	50	50	50	80	80	80
A	1/13/2003	9.07	27.5	27.5	27.5	58.8	58.8	58.8	92.6	92.6	92.6
A	2/19/2003	5.38	23.8	23.8	23.8	42.3	42.3	42.3	75.6	75.6	75.6
A	3/26/2003	1.42	12.4	12.4	12.4	12.3	12.3	12.3	33.7	33.7	33.7
A	4/2/2003	1.2 J	13	13	13	13.4	13.4	13.4	25.6	25.6	25.6
A	5/8/2003	3.75	18.4	18.4	18.4	14	14	14	24.9	24.9	24.9
A	12/29/2003	NA	<10	<10	<10	<10	<10	<10	<20	<20	<20
A	1/9/2004	NA	<10	<10	<10	<5.0	<5.0	<5.0	<10	<10	<10
A	2/2/2004	NA	48	48	48	40	40	40	540	540	540
A	3/26/2004	NA	13	13	13	<5.0	<5.0	<5.0	14	14	14
A	10/19/2004	NA	21	21	21	17	17	17	37	37	37
A	12/8/2004	NA	5.3	5.3	5.3	<5.0	<5.0	<5.0	16	16	16
A	1/7/2005	NA	6.9	6.9	6.9	9.9	9.9	9.9	21	21	21
A	2/28/2005	NA	8.7	8.7	8.7	5.9	5.9	5.9	19	19	19
A	3/23/2005	NA	7.2	7.2	7.2	<5	<5	<5	11	11	11
A	4/7/2005	NA	7.3	7.3	7.3	<5.0	<5.0	<5.0	15	15	15
A	5/9/2005	NA	15	15	15	<5.0	<5.0	<5.0	14	14	14
A	11/3/2005	NA	17	17	17	<5.0	<5.0	<5.0	14	14	14
A	12/1/2005	NA	7.9	7.9	7.9	<5.0	<5.0	<5.0	13	13	13
A	1/3/2006	NA	6.4	6.4	6.4	7.4	7.4	7.4	13	13	13
A	2/27/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
A	3/16/2006	NA	6.1	6.1	6.1	8.3	8.3	8.3	14	14	14
A	4/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
A	5/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
A	6/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
A	10/1/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
A	11/21/2006	NA	12	12	12	13	13	13	23	23	23
A	12/12/2006	NA	8	8	8.0	<5.0	<5.0	<5.0	12	12	12
A	2/21/2007	NA	8.7	8.7	8.7	6.4	6.4	6.4	13	13	13
A	3/27/2007	NA	30	30	30	6	6	6	21	21	21
A	4/12/2007	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

CAO - Cleanup and Abatement Order (R1-2001-26), Freshwater Criteria
WQO - Water Quality Objective
Red Text - Exceedance of WQO (at CMC or CCC or CAO values)
ug/l - micrograms per liter
CMC - Criteria Maximum Concentration
CCC - Criteria Continuous Concentration

⁽¹⁾The numbers listed here have been compared to capped calculated CAO values as total recoverable. CAO values listed as dissolved were converted to total recoverable using the equations, conversion factors and a hardness of 100 mg/L as noted in the CFR 131.38 (dissolved CAO limits occur at hardness of 100 mg/L). The total recoverabable values equal the dissolved values, with the exception of lead.

CAO Criteria	
CAO Arsenic	150 ug/L dissolved
CAO Copper	9.0 ug/L dissolved
CAO Lead	2.5 ug/L dissolved
CAO Zinc	120 ug/L dissolved

⁽²⁾ CAO states that detection limit is 3 ug/L and is controlling. All values under 3.0 ug/L are converted to 3.0 ug/L.

Table 2
Analytical Results Summary - Surface Water
Station A
Revised February 22, 2008
CEA No. 07040

[illegible]

Table 3
Analytical Results Summary - Surface Water
Station B
Revised February 22, 2008
CEA No. 07040

LOCATION	DATE	ARSENIC (total) ug/l	COPPER (total) ug/l	COPPER (total) ug/l	COPPER (total) ug/l	LEAD (total) ug/l	LEAD (total) ug/l	LEAD (total) ug/l	ZINC (total) ug/l	ZINC (total) ug/l	ZINC (total) ug/l
Data Compared to:		CCC 150 ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽¹⁾	Freshwater CMC at Noted Hardness ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽¹⁾	Freshwater CMC at Noted Hardness ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽¹⁾	Freshwater CMC at Noted Hardness ug/l
B	11/28/2001	27	400	400	400	790	790	790	1100	1100	1100
B	12/17/2001	5.7	21	21	21	3.2	3.2	3.2	40	40	40
B	1/8/2002	14	55	55	55	110	110	110	120	120	120
B	2/7/2002	11	26	26	26	32	32	32	54	54	54
B	12/19/2002	<2	16	16	16	19	19	19	45	45	45
B	1/13/2003	5.34/4.37	33.7/35.3	33.7/35.3	33.7/35.3	160/176	160/176	160/176	179/197	179/197	179/197
B	2/19/2003	<1/1.25	24.4/26.4	24.4/26.4	24.4/26.4	66.8/74.2	66.8/74.2	66.8/74.2	85.7/95.9	85.7/95.9	85.7/95.9
B	3/26/2003	3.49/4.16	19.6/20	19.6/20	19.6/20	31.9/30.3	31.9/30.3	31.9/30.3	53.6/53.2	53.6/53.2	53.6/53.2
B	4/2/2003	6.43 J/ 4.65 J	38/34	38/34	38/34	106/107	106/107	106/107	123/120	123/120	123/120
B	5/8/2003	6.62/5.99	25.4/25.1	25.4/25.1	25.4/25.1	81.9/81.6	81.9/81.6	81.9/81.6	70.3/69.8	70.3/69.8	70.3/69.8
B	12/29/2003	NA	29/19	29/19	29/19	5.9/5.1	5.9/5.1	5.9/5.1	16/17	16/17	16/17
B	1/9/2004	NA	10/<10	10/<10	10/<10	<5.0/5.2	<5.0/5.2	<5.0/5.2	<10/<10	<10/<10	<10/<10
B	2/2/2004	NA	13/20	13/20	13/20	<5.0/18	<5.0/18	<5.0/18	18/35	18/35	18/35
B	3/26/2004	NA	11/15	11/15	11/15	<5.0/<5.0	<5.0/<5.0	<5.0/<5.0	16/21	16/21	16/21
B	10/19/2004	NA	12/10	12/10	12/10	5.4/5.6	5.4/5.6	5.4/5.6	18/11	18/11	18/11
B	12/8/2004	NA	8.5/8.7	8.5/8.7	8.5/8.7	<5.0/<5.0	<5.0/<5.0	<5.0/<5.0	16/25	16/25	16/25
B	1/7/2005	NA	<5.0/<5.0	<5.0/<5.0	<5.0/<5.0	5.3/6.1	5.3/6.1	5.3/6.1	<10/11	<10/11	<10/11
B	2/28/2005	NA	5.1/4.8	5.1/4.8	5.1/4.8	1.6/1.4	1.6/1.4	1.6/1.4	6.5/8.3	6.5/8.3	6.5/8.3
B	3/23/2005	NA	10/9.5	10/9.5	10/9.5	<5.0/<5.0	<5.0/<5.0	<5.0/<5.0	<10/<10	<10/<10	<10/<10
B	4/7/2005	NA	7.5/6.7	7.5/6.7	7.5/6.7	<5.0/<5.0	<5.0/<5.0	<5.0/<5.0	12/<10	12/<10	12/<10
B	5/9/2005	NA	7.3/7.6	7.3/7.6	7.3/7.6	<5.0/<5.0	<5.0/<5.0	<5.0/<5.0	<10/<10	<10/<10	<10/<10
B	11/3/2005	NA	9.2/7.4	9.2/7.4	9.2/7.4	6.1/<5.0	6.1/<5.0	6.1/<5.0	18/15	18/15	18/15
B	12/1/2005	NA	19/17	19/17	19/17	6.4/5.6	6.4/5.6	6.4/5.6	18/17	18/17	18/17
B	1/3/2006	NA	7.4/7.4	7.4/7.4	7.4/7.4	7.4/7.7	7.4/7.7	7.4/7.7	<10/<10	<10/<10	<10/<10
B	2/27/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
B	3/16/2006	NA	6.6/6.1	6.6/6.1	6.6/6.1	9.5/9.1	9.5/9.1	9.5/9.1	14/25	14/25	14/25
B	4/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
B	5/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
B	6/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
B	10/1/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
B	11/21/2006	NA	25/19	25/19	25/19	33/21	33/21	33/21	67/48	67/48	67/48
B	12/12/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
B	2/21/2007	NA	10	10	10	<5.0	<5.0	<5.0	<10	<10	<10
B	3/27/2007	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
B	4/12/2007	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

CAO - Cleanup and Abatement Order (R1-2001-26), Freshwater Criteria
WQO - Water Quality Objective
Red Text - Exceedance of WQO (at CMC or CCC or CAO). [Note: If one duplicate exceeded the criteria and the other was less than the MDL, it was considered an exceedance.]
ug/l - micrograms per liter
CMC - Criteria Maximum Concentration
CCC - Criteria Continuous Concentration

⁽¹⁾The numbers listed here have been compared to capped calculated CAO values as total recoverable. CAO values listed as dissolved were converted to total recoverable using the equations, conversion factors and a hardness of 100 mg/L as noted in the CFR 131.38 (dissolved CAO limits occur at hardness of 100 mg/L). The total recoverabable values equal the dissolved values, with the exception of lead.

CAO Criteria	
CAO Arsenic	150 ug/L dissolved
CAO Copper	9.0 ug/L dissolved
CAO Lead	2.5 ug/L dissolved
CAO Zinc	120 ug/L dissolved

⁽²⁾ CAO states that detection limit is 3 ug/L and is controlling. All values under 3.0 ug/L are converted to 3.0 ug/L.

Table 3
Analytical Results Summary - Surface Water
Station B
Revised February 22, 2008
CEA No. 07040

[illegible]

Table 4
Analytical Results Summary - Surface Water
Station D
Revised February 22, 2008
CEA No. 07040

LOCATION	DATE	ESTUARY ARSENIC (total) ug/l	ESTUARY COPPER (total) ug/l	ESTUARY COPPER (total) ug/l	ESTUARY LEAD (total) ug/l	ESTUARY ZINC (total) ug/l	FRESHWATER COPPER (total) ug/l	FRESHWATER COPPER (total) ug/l	FRESHWATER COPPER (total) ug/l	FRESHWATER LEAD (total) ug/l	FRESHWATER LEAD (total) ug/l	FRESHWATER LEAD (total) ug/Ll	FRESHWATER ZINC (total) ug/l	FRESHWATER ZINC (total) ug/l	FRESHWATER ZINC (total) ug/l
Data Compared to:		CCC ⁽¹⁾ : 36 ug/l	CCC ⁽¹⁾ : 3.7 ug/l	CMC ⁽¹⁾ : 5.8 ug/l	CCC ⁽¹⁾ : 8.5 ug/l	CCC ⁽¹⁾ : 86 ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽²⁾	Freshwater CMC at Noted Hardness ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽²⁾	Freshwater CMC at Noted Hardness ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽²⁾	Freshwater CMC at Noted Hardness ug/l
D	11/28/2001	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
D	12/17/2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D	1/8/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D	2/7/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D	12/19/2002	17	5.9	5.9	1	1.3	5.9	5.9	5.9	1	1	1	1.3	1.3	1.3
D	1/13/2003	28.1	3.56	3.56	1.22	14.3	3.56	3.56	3.56	1.22	1.22	1.22	14.3	14.3	14.3
D	2/19/2003	20.1	3.18	3.18	<1	15.9	3.18	3.18	3.18	<1	<1	<1	16	16	16
D	3/26/2003	17.6	4.24	4.24	<1	19.9	4.24	4.24	4.24	<1	<1	<1	20	20	20
D	4/2/2003	56.8 J	24.3	24.3	2.77	27.2	24.3	24.3	24.3	2.77	2.77	2.77	27	27	27
D	5/8/2003	9.78	1.87	1.87	<1	10.3	1.87	1.87	1.87	<1	<1	<1	10	10	10
D	12/29/2003	NA	33	33	<5.0	24	33	33	33	<5.0	<5.0	<5.0	24	24	24
D	1/9/2004	NA	<10	<10	<5.0	<10	<10	<10	<10	<5.0	<5.0	<5.0	<10	<10	<10
D	2/2/2004	NA	16	16	<5.0	27	16	16	16.0	<5.0	<5.0	<5.0	27	27	27
D	3/26/2004	NA	5	5	<5.0	26	5	5	5	<5.0	<5.0	<5.0	26	26	26
D	10/19/2004	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
D	12/8/2004	NA	<5.0	<5.0	<5.0	27	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	27	27	27
D	1/7/2005	NA	<5.0	<5.0	<5.0	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10
D	2/28/2005	NA	2.4	2.4	<1	7.9	2.4	2.4	2.4	<1	<1	<1	8	8	8
D	3/23/2005	NA	<5	<5	<5	<10	<5	<5	<5	<5	<5	<5	<10	<10	<10
D	4/7/2005	NA	<5	<5	<5	10	<5	<5	<5	<5	<5	<5	10	10	10
D	5/9/2005	NA	<5	<5	<5	<10	<5	<5	<5	<5	<5	<5	<10	<10	<10
D	11/3/2005	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
D	12/1/2005	NA	9.5	9.5	<5	13	9.5	9.5	9.5	<5	<5	<5	13	13	13
D	1/10/2006	NA	<5.0	<5.0	<5	<10	<5.0	<5.0	<5.0	<5	<5	<5	<10	<10	<10
D	2/27/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
D	3/16/2006	NA	<5.0	<5.0	<3	<10	<5.0	<5.0	<5.0	<3	<3	<3	<10	<10	<10
D	4/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
D	5/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
D	6/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
D	10/1/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
D	11/21/2006	NA	160	160	<5.0	34	160	160	160	<5.0	<5.0	<5.0	34	34	34
D	12/12/2006	NA	19	19	<5.0	16	19	19	19	<5.0	<5.0	<5.0	16	16	16
D	2/21/2007	NA	6.6	6.6	<5.0	<10	6.6	6.6	6.6	<5.0	<5.0	<5.0	<10	<10	<10
D	3/27/2007	NA	<5.0	<5.0	<5.0	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10	<10
D	4/12/2007	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

CAO - Cleanup and Abatement Order (R1-2001-26), Freshwater Criteria
WQO - Water Quality Objective
Red Text - Exceedance of WQO (at CMC or CCC or CAO values)
ug/l - micrograms per liter
CMC - Criteria Maximum Concentration
CCC - Criteria Continuous Concentration

⁽¹⁾The numbers listed here have been converted from dissolved to total recoverable. The WQO for each metal is listed in the CFR 131.38 as dissolved solids. The dissolved solids values are listed below. As the data for comparison is recoreded in total recoverable, a conversion factor as described in the CFR 131.38 was applied to convert the criteria from dissolved to total recoverable. Conversion factors listed below.

Criteria	
WQO Arsenic	36 ug/L dissolved
WQO Copper	3.1 ug/L dissolved
WQO Lead	8.1 ug/L dissolved
WQO Zinc	81 ug/L dissolved
WQO Copper i	4.8 ug/L dissolved
Conversion Factors	
CF Arsenic	1.000
CF Copper	0.830
CF Lead	0.951
CF Zinc	0.946
CF Copper	0.830

⁽²⁾The numbers listed here have been compared to capped calculated CAO values as total recoverable. CAO values listed as dissolved were converted to total recoverable using the equations, conversion factors and a hardness of 100 mg/L as noted in the CFR 131.38 (dissolved CAO limits occur at hardness of 100 mg/L). The total recoverabable values equal the dissolved values, with the exception of lead.

CAO Criteria	
CAO Arsenic	150 ug/L dissolved
CAO Copper	9.0 ug/L dissolved
CAO Lead	2.5 ug/L dissolved
CAO Zinc	120 ug/L dissolved

⁽³⁾ CAO states that detection limit is 3 ug/L and is controlling. All values under 3.0 ug/L are converted to 3.0 ug/L.

Table 4
Analytical Results Summary - Surface Water
Station D
Revised February 22, 2008
CEA No. 07040

[illegible]

Table 5
Analytical Results Summary - Surface Water
Station F
Revised February 22, 2008
CEA No. 07040

LOCATION	DATE	ARSENIC (total) ug/L	COPPER (total) ug/L	COPPER (total) ug/l	COPPER (total) ug/L	LEAD (total) ug/l	LEAD (total) ug/l	LEAD (total) ug/L	ZINC (total) ug/L	ZINC (total) ug/l	ZINC (total) ug/L
Data Compared to:		CCC: 150 ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽¹⁾	Freshwater CMC at Noted Hardness ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽¹⁾	Freshwater CMC at Noted Hardness ug/l	Freshwater CCC at Noted Hardness ug/l	Freshwater CCC at CAO Limits and at Noted Hardness ug/l ⁽¹⁾	Freshwater CMC at Noted Hardness ug/l
F	11/28/2001	<5	24	24	24	<15	<15	<15	190	190	190
F	12/17/2001	13	17	17	17	29	29	29	300	300	300
F	1/8/2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
F	2/7/2002	21	27	27	27	87	87	87	560	560	560
F	12/19/2002	7.1	34	34	34	130	130	130	230	230	230
F	1/13/2003	5.03	19.7	19.7	19.7	55.6	55.6	55.6	123	123	123
F	2/19/2003	2.33	25.7	25.7	25.7	71	71	71	140	140	140
F	3/26/2003	4.3	9	9	9	4.85	4.85	4.85	3.03	3.03	3.03
F	4/2/2003	<1 UJ	13	13	13	16.9	16.9	16.9	40.9	40.9	40.9
F	5/8/2003	3.01	19	19	19	10.7	10.7	10.7	37.3	37.3	37.3
F	12/29/2003	NA	40	40	40	7.8	7.8	7.8	190	190	190
F	1/9/2004	NA	62	62	62	130	130	130	320	320	320
F	2/2/2004	NA	22	22	22	39	39	39	110	110	110
F	3/26/2004	NA	25	25	25	<5.0	<5.0	<5.0	39	39	39
F	10/19/2004	NA	13	13	13	18	18	18	37	37	37
F	12/8/2004	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
F	1/7/2005	NA	8.3	8.3	8.3	21	21	21	46	46	46
F	2/28/2005	NA	14	14	14	6.3	6.3	6.3	47	47	47
F	3/23/2005	NA	12	12	12	<5	<5	<5	32	32	32
F	4/7/2005	NA	5.9	5.9	5.9	7.4	7.4	7.4	47	47	47
F	5/9/2005	NA	7.4	7.4	7.4	8.3	8.3	8.3	43	43	43
F	11/3/2005	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
F	12/1/2005	NA	7.4	7.4	7.4	5.9	5.9	5.9	34	34	34
F	1/3/2006	NA	6.5	6.5	6.5	16	16	16	32	32	32
F	2/27/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
F	3/16/2006	NA	<5	<5	<5	11	11	11	28	28	28
F	4/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
F	5/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
F	6/30/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
F	10/1/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
F	11/21/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
F	12/12/2006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
F	2/21/2007	NA	6.2	6.2	6.2	<5.0	<5.0	<5.0	63	63	63
F	3/27/2007	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
F	4/12/2007	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

CAO - Cleanup and Abatement Order (R1-2001-26), Freshwater Criteria
WQO - Water Quality Objective
Red Text - Exceedance of WQO (at CMC or CCC or CAO values)
ug/l - micrograms per liter
CMC - Criteria Maximum Concentration
CCC - Criteria Continuous Concentration

⁽¹⁾The numbers listed here have been compared to capped calculated CAO values as total recoverable. CAO values listed as dissolved were converted to total recoverable using the equations, conversion factors and a hardness of 100 mg/L as noted in the CFR 131.38 (dissolved CAO limits occur at hardness of 100 mg/L). The total recoverabable values equal the dissolved values, with the exception of lead.

CAO Criteria	
CAO Arsenic	150 ug/L dissolved
CAO Copper	9.0 ug/L dissolved
CAO Lead	2.5 ug/L dissolved
CAO Zinc	120 ug/L dissolved

⁽²⁾ CAO states that detection limit is 3 ug/L and is controlling. All values under 3.0 ug/L are converted to 3.0 ug/L.

Table 5
Analytical Results Summary - Surface Water
Station F
Revised February 22, 2008
CEA No. 07040

[illegible]

Table 7
Analytical Results Summary: Sediment
July 16, 2000 - 2000
CEA No. 07040

Sample ID	SOURTS - FRESHWATER	SOURTS - MARINE	S-1 (EASTERN DITCH)	S-2 (EASTERN DITCH)	S-3 (EASTERN DITCH)	S-4 (EASTERN DITCH)	S6 (STATION C)	S7 (STATION B)	S8 (SOUTHERN DITCH)	S9 (WESTERN DITCH)	S10 (EASTERN DITCH)	S-11 (CLARK SLOUGH)	S-12 (CLARK SLOUGH)	S-13 (CONNECTION BETWEEN CLARK SLOUGH/HUBBOLDT BAY)	S-14 (DUPLICATE OF S-4)
Sampling Date	Upper Effects Threshold	Apparent Threshold	7/1/00	7/1/00	7/1/00	7/1/00	7/12/00	7/12/00	7/12/00	7/12/00	7/12/00	7/12/00	7/12/00	7/12/00	7/1/00
Labels - mg/kg															
Arsenite	3,000	9.3	1.7	0.42	3.1	1.6	0.46	0.92	0.81	1.4	1.3	1.1	2.8	0.7	1.8
Arsenic	17,000	35,000	31,800	26,500	26,600	12,400	4,480	5,660	5,400	112,000	6,860	3,480	10,800	2,000	8,000
Beryllium	na	48,000	72,600	54,600	146,000	67,000	99,700	74,600	91,700	190,000	56,300	45,700	87,700	74,900	42,400
Bismuth	na	na	0.19	J	0.22	J	0.26	J	0.48	J	0.51	0.18	J	0.35	J
Chromium	3,000	3.0	3.2	1.2	3.7	2.8	0.95	J	0.94	J	2.3	0.67	60.3	0.19	2.4
Cadmium	96,000	66.0	32.0	44.7	66.3	61.3	51.7	52.1	74.6	178.6	53.8	38.4	138.0	59.2	41.2
Copper	88,000	398.0	606	35.3	106.0	47.6	39.2	35.0	32.6	102.0	54.2	75.6	38.5	27.0	38.5
Lead	127,000	400.0	145.0	81.0	232.0	75.9	649.0	71.1	13.0	160.0	93.4	93.4	214.0	30.2	102.0
Manganese	0.96	0.41	0.47	0.1	J	0.16	J	0.13	J	0.3	J	0.2	0.46	J	J
Methylmercury	na	na	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	48,000	110.0	31.8	52.0	61.0	53.3	43.0	11.3	38.0	51.0	51.2	34.8	8.0	7.9	47.9
Selenium	17,000	11.2	0.15	J	0.2	0.14	0.15	J	0.15	J	0.14	J	J	0.16	J
Silver	4,500	3.1	0.16	0.13	0.2	0.14	J	0.22	J	0.17	0.14	0.58	1	0.16	0.21
Thallium	na	na	4.1	4.8	5.4	3.7	3.7	4.7	6.8	7.6	3.5	3.2	J	4.3	3.8
Vanadium	na	57	24.2	32.9	54.8	39.7	31.3	39.8	49	69.5	45.2	27	60.8	42.6	32.4
Zinc	520,000	410.0	752.0	324.0	764.0	514.0	J	255.0	J	238.0	J	243.0	526.0	J	404.0
Sum Volatile Organic Compounds, uM/kg															
Benzaldehyde	na	na	74.0	ND	ND	30.0	J	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	48,000	130.0	44.0	46.0	68.0	46.0	56.0	36.0	41.0	36.0	46.0	ND	ND	46.0	J
Benzophenone	1,500	230.0	57.0	J	110.0	46.0	ND	ND	ND	33.0	J	ND	ND	ND	J
Naphthalene	600,000	230.0	ND	J	ND	ND	ND	ND	ND	J	ND	ND	ND	ND	43.0
Caproic acid	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylanthracene	na	64.0	200.0	J	ND	120.0	J	90.0	J	44.0	J	ND	ND	ND	84.0
Acenaphthylene	160,000	71.0	81.0	J	ND	ND	ND	ND	ND	58.0	J	ND	ND	ND	ND
Dibenzofuran	5100	110.0	62.0	J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Peranthracene	na	17.0	210.0	J	10000.0	1100.0	J	990.0	J	910.0	J	1100.0	3600.0	J	880.0
Phenanthrene	800	660.0	330.0	J	96.0	J	81.0	J	74.0	140.0	J	54.0	480.0	52.0	J
Anthracene	280	280.0	69.0	J	ND	ND	ND	44.0	J	66.0	J	100.0	J	100.0	J
Fluorene	1,500	250.0	77.0	J	170.0	J	130.0	J	ND	350.0	J	66.0	130.0	J	J
Benzo[a]anthracene	2,000	250.0	77.0	J	210.0	J	180.0	J	460.0	J	370.0	J	1200.0	J	J
Chrysene	1,000	140.0	140.0	J	ND	ND	ND	170.0	J	270.0	J	610.0	820.0	J	J
Benzo[k]fluoranthene	na	800	440.0	J	410.0	J	520.0	J	410.0	J	ND	2400.0	10000.0	J	350.0
4-Methylphenol	na	1000.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorobenzene	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbazole	na	na	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo[a]anthracene	500	960.0	ND	ND	ND	ND	ND	130.0	J	1700.0	J	ND	420.0	J	ND
Dibenz[a,h]anthracene	na	61.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	450.0	J	ND	ND
Benzo[b]fluoranthene	na	1800.0	ND	ND	ND	ND	98.0	J	ND	340.0	J	ND	940.0	J	64.0
Benzo[k]fluoranthene	13400	1800.0	ND	ND	ND	ND	ND	74.0	J	95.0	J	ND	280.0	J	ND
Benzofluoranthene	700	1100.0	ND	ND	ND	ND	ND	ND	ND	1600.0	J	500.0	610.0	J	ND
Benzo[a]pyrene	330	600.0	ND	ND	ND	ND	ND	ND	ND	1100	J	350.0	670.0	J	ND
Benzo[a]fluoranthene	330	610.0	ND	ND	ND	ND	ND	ND	ND	1100	J	350.0	770.0	J	ND

Bold - Greater than UET/AET
J - Estimated result. Result is less than the Reporting Limit
na - Not applicable
ND - Not Detected
U - Analyte was analyzed for but not detected above the sample detection limit
Data Source for S-1 to S-14, is *Preliminary Assessment Site Inspection*, CARWCCS, May 7, 2001. The report refers to these samples as "soil samples" in the Sediment Sampling Section (3.2.2)

Table 3
Fish Data Collected January 10, 2008
Humboldt Baykeeper

Parameter	Sample 1		Sample 4	
Dioxins / Furans*	Concentration	TEQ Concentration	Concentration	TEQ Concentration
2,3,7,8-TCDD	0.47	0.470	0.41	0.410
Total TCDD	0.68		0.54	
1,2,3,7,8-PeCDD	2.00	2.000	1.3	1.300
Total PeCDD	2.8		1.3	
1,2,3,4,7,8-HxCDD	0.95 J	0.095	0.40 J JA	0.040
1,2,3,6,7,8-HxCDD	4.2	0.420	2.1	0.210
1,2,3,7,8,9-HxCDD	1.4	0.140	0.66 J	0.066
Total HxCDD	29		8.6	
1,2,3,4,6,7,8-HpCDD	73	0.730	35	0.350
Total HpCDD	160		59	
OCDD	310	0.093	120	0.036
2,3,7,8-TCDF	0.17 CON J	0.017	0.28 CON J J	0.028
Total-TCDF	0.77		0.95	
1,2,3,7,8-PeCDF	0.24 J JA	0.007	0.24 J JA	0.007
2,3,4,7,8,-PeCDF	0.42 J	0.130	0.23 J	0.069
Total PeCDF	1.8		1.1	
1,2,3,4,7,8-HxCDF	0.59 J	0.059	0.33 J JA	0.033
1,2,3,6,7,8-HxCDF	0.80 J JA	0.080	0.62 J	0.062
2,3,4,6,7,8-HxCDF	0.25 J	0.025	0.15 J	0.015
1,2,3,7,8,9-HxCDF	<0.075	0	<0.045	0
Total HxCDF	3.0		2.8	
1,2,3,4,6,7,8-HpCDF	2.0 JA	0.020	0.82 J JA	0.008
1,2,3,4,7,8,9-HpCDF	<0.47	0	<0.55	0
Total HpCDF	4.8		1.6	
OCDF	4.3	0.001	2.5	0.001
Others				
Arsenic **	0.24		0.34	
Copper **	1.6		1.3	
Percent Lipids	3.5		3.4	

Notes:

* All dioxins & furans data in and of pg/g. (Analysis Method SW846 8290).

**Arsenic & Copper in mg/kg. (Analysis Method SW846 6020).

% Lipids (Analysis Method SW846 8290).

E Estimated result. Result concentration exceeds the calibration range.

CON Confirmation analysis

J Estimated result. Result is less than the reporting limit.

Sample 1 - Leptocottus armatus

Sample 4 - Cottus asper

Note: Samples 2 & 3 were not analyzed

Table 6(b)
Analytical Results Summary - Sediments
July 30, 2007, Sampling Event
CEA No. 07040

Sample ID	SQuiRTS - FRESHWATER	SQuiRTS - MARINE	S-1 (EASTERN DITCH)	Q	S-4 (STATION C)	Q	S-5 (STATION D)	Q	S-6 (STATION B)	Q	S-7 (WESTERN DITCH)	Q
Sampling Date	Upper Effects Threshold	Apparent Effects Threshold	7/30/07		7/30/07		7/30/07		7/30/07		7/30/07	
<i>Metals - mg/kg</i>												
Antimony	3.000	9.3	2.3		3.9		3.9		1.8		2.9	
Arsenic	17.00	35.00	19.1		30.1		695.0		37.5		107	
Barium	na	48.00	90.7		296.0		460.0		140.0		106	
Beryllium	na	na	0.25		0.48		0.41		0.3		0.5	
Cadmium	3.00	3.0	2.3		4.7		1.2		0.89		1	
Chromium	95.00	62.0	114.0		81.0		54.8		64.1		73.9	
Copper	86.00	390.0	57.1		154.0		61.6		64.7		84.2	
Lead	127.00	400.0	149.0		145.0		97.2		154.0		111	
Mercury	0.56	0.41	0.22		0.21		0.21		0.17		0.24	
Molybdenum	na	na	1		5.90		6.4		3.20		2	
Nickel	43.00	110.0	62.9		81.5		101.0		64.3		85.1	
Selenium	na	1	0.4		1.1		0.9		0.37		0.63	
Silver	4.50	3.1	0.14		0.36		0.25	B	0.18		0.26	
Thallium	na	na	0.94	B	ND		ND		ND		0.13	B
Vanadium	na	57	31		62.6		58.7		47.7		66.3	
Zinc	520.00	410.0	393.0		1030.0		319.0		206.0		236	
<i>PCBs - ug/kg</i>												
Total PCBs	26.00	110.00	120		ND		ND		63.0		NA	
<i>Pesticides - ug/kg</i>												
4-4'- DDT	na	na	6.7		NA		5.2	JPG	17.0	J	NA	
4,4'-DDE	na	na	ND		NA		ND		200.0		NA	

Table 6(b)
Analytical Results Summary - Sediments
July 30, 2007, Sampling Event
CEA No. 07040

Sample ID	SQuiRTS - FRESHWATER	SQuiRTS - MARINE	S-1 (EASTERN DITCH)	Q	S-4 (STATION C)	Q	S-5 (STATION D)	Q	S-6 (STATION B)	Q	S-7 (WESTERN DITCH)	Q
Sampling Date	Upper Effects Threshold	Apparent Effects Threshold	7/30/07		7/30/07		7/30/07		7/30/07		7/30/07	
<i>Dioxins/Furans, pg/g</i>												
2,3,7,8-TCDD as TEQs	8.80	3.60	216.6		NA		592.72		402.3		NA	
<i>Total Petroleum Hydrocarbons - mg/kg</i>												
TPH - MO	na	na	ND	B	3700.0	G	380.0	G	ND		110	G
<i>Volatile Organic Compounds - ug/kg</i>												
Tetrachloroethene	450.00	na	11.00		ND		ND		ND		ND	
Toluene	5000.00	na	43.00		ND		240.0		ND		ND	
<i>Semi Volatile Organic Compounds, ug/kg</i>												
Benzaldehyde	na	na	ND		NA		ND		ND		ND	
Phenol	48.00	130.0	ND		NA		ND		ND		ND	
4-Methylphenol	na	8.0	ND		NA		ND		ND		ND	
Napthalene	600.00	230.0	ND		NA		ND		ND		ND	
Caprolactam	na	na	ND		NA		ND		ND		ND	
2-Methylnaphthalene	na	64.0	ND		NA		ND		ND		ND	
Acenaphthylene	160.00	71.0	ND		NA		ND		ND		ND	
Dibenzofuran	5100	110.0	ND		NA		ND		ND		ND	
Pentachlorophenol	na	17.0	ND		NA		ND		ND		ND	
Phenanthrene	800	660.0	ND		NA		ND		ND		ND	
Anthracene	260	280.0	ND		NA		ND		ND		ND	
Fluoranthene	1500	1300.0	ND		NA		ND		ND		ND	
Pyrene	1000	2400.0	ND		NA		ND		ND		ND	
Chrysene	800	950.0	ND		NA		ND		ND		ND	
bis(2-Ethylhexyl)phthalate	na	na	ND		NA		ND		ND		ND	
4-Nitrophenol	na	1000.0	ND		NA		ND		ND		ND	
2,4-Dinitrotoluene	na	na	ND		NA		ND		ND		ND	
Carbazole	na	na	ND		NA		ND		ND		ND	
Benzo(a)anthracene	500	960.0	ND		NA		ND		ND		ND	
Di-n-octylphthalate	na	61.0	ND		NA		ND		ND		ND	
Benzo(b)fluoranthene	na	1800.0	ND		NA		ND		ND		ND	
Benzo(k)fluoranthene	13400	1800.0	ND		NA		ND		ND		ND	
Benzo(a)pyrene	700	1100.0	ND		NA		ND		ND		ND	
Indeno(1,2,3-cd)pyrene	330	600.0	ND		NA		ND		ND		ND	
Benzo(g,h,i)perylene	300	670.0	ND		NA		ND		ND		ND	

Table 6(b)
Analytical Results Summary - Sediments
July 30, 2007, Sampling Event
CEA No. 07040

Sample ID	SQuiRTS - FRESHWATER	SQuiRTS - MARINE	S-1 (EASTERN DITCH)	Q	S-4 (STATION C)	Q	S-5 (STATION D)	Q	S-6 (STATION B)	Q	S-7 (WESTERN DITCH)	Q
Sampling Date	Upper Effects Threshold	Apparent Effects Threshold	7/30/07		7/30/07		7/30/07		7/30/07		7/30/07	
Bold - Greater than UET/AET												
B - Analyte found in associated blank and sample												
RLA - The reporting limit for this analyte is elevated due to sample dilution												
NA - Not Analyzed												
na - not applicable												
ND - Not Detected												
J - Estimated result, Result is less than the Reporting Limit												
PG - The percent difference between the original and confirmation analyses is greater than 40%												
U - Analyte was analyzed for but not detected above the sample detection limit												
Data Source for S-1 to S-14, is <i>Preliminary Assessment Site Inspection</i> , CARWQCB, May 7, 2001. The report refers to these samples as "soil samples" in the Sediment Sampling Section (3.2.2)												

Table 7
Sediment Data Collected January 2008
Humboldt Baykeeper

Parameter	Sediment 1	Sediment 2	Sediment 3	Sediment 4
2,3,7,8-TCDD	1.2	37	1.9 JA	2
Total TCDD	50	410	36	21
1,2,3,7,8-PeCDD	5.6	320	14	8.4
Total PeCDD	82	1400	59	44
1,2,3,4,7,8-HxCDD	9.8	510	22	9.3
1,2,3,6,7,8-HxCDD	21	1300	48	33
1,2,3,7,8,9-HxCDD	24	960	38	22
Total HxCDD	220	7800	290	170
1,2,3,4,6,7,8-HpCDD	430	22000 E	630	560
Total HpCDD	850	50000	1200	990
OCDD	2800 E	81000 E	3700	4000 EB
2,3,7,8-TCDF	1.8 CON	36 CON	2.5 CON	1.8 CON
Total-TCDF	38	610	38	30
1,2,3,7,8-PeCDF	2.0 J	53	2.6 J,JA	2.5 J
2,3,4,7,8,-PeCDF	2.4 J	64	3.3 J	3.4
Total PeCDF	43	1700	95	76
1,2,3,4,7,8-HxCDF	9.1	300	12	7.8
1,2,3,6,7,8-HxCDF	4.4	200	8.4	6.8
2,3,4,6,7,8-HxCDF	2.6 J	170	8.00	5.5
1,2,3,7,8,9-HxCDF	<0.27	7.4	<0.70	ND
Total HxCDF	120	5900	230	220
1,2,3,4,6,7,8-HpCDF	68	5300 E	170	120
1,2,3,4,7,8,9-HpCDF	6.00	280	11	6.2
Total HpCDF	250	16000	560	410
OCDF	170	5700 E	440	330

* All data in and of pg/g

* Analysis method SW846 8290

E Estimated result. Result concentration exceeds the calibration range.

CON Confirmation analysis

J Estimated result. Result is less than the reporting limit.

References:

Agency for Toxic Substances Disease Registry, 1998. Toxicological Profile for Chlorinated Dibenzo-p-dioxins.

California State Water Resources Control Board (SWRCB), 2007, Geomatrix White Paper: 2006 Humboldt Bay Clean Water Act Section 303(d) Listing for Dioxins, letter to Mr. Mark Pawlicki of Sierra Pacific Industries from Mr. Thomas Howard, SWRCB, February 5.

California Toxic Rule, 40 CFR Part 131, 65 Fed. Reg. 31682 (May 18, 2000)

Canadian Council of Ministers of the Environment (CCME), 2001a, Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Polychlorinated Dibenzo-*P*-Dioxins and Polychlorinated Dibenzofurans (PCDD/Fs). In: Canadian Environmental Quality Guidelines, 1999, Winnipeg.

City of Eureka, 2005. City of Eureka and Humboldt Bay Harbor, Recreational and Conservation District, Cooperative Eureka Waterfront Facilities Maintenance Dredge Project, Eureka Channel, Humboldt Bay California-Sampling Results Report for Dioxin/Furans, PCP and PCB Testing. December, 2005.

Geomatrix, 2004, Scoping Ecological and Off-Site human Health Risk Assessment, Sierra Pacific Industries, Arcata Division Sawmill, Arcata, California. September 8, 2004.

H. T. Harvey and Associates, 2008, Rebuttal of Dr. Ellis' "Expert Report Regarding Former Union Pacific Railroad Yard: Imminent and Substantial Endangerment"

International Agency for Research on Cancer, 1997,
<<http://monographs.iarc.fr/ENG/Monographs/vol69/volume69.pdf>>.

Site Photos, Dated from 1989, 1995, 2007, 2008
SWAPE , Sediment and Water Sampling Report, January 10, 2008, Former Eureka Rail Yard," Balloon Track," Eureka, CA.

Testamerica, February 14, 2008, Project Number: G8A230302, Fish Tissue Sample Lab Results

United States Environmental Protection Agency (U.S. EPA), 2007 February, Revised guidance for copper (FR February 22, 2007 [(Volume 72, Number 35) (pages 7983-7985)])

U.S. EPA Region 9, 2006, Partial Approval Letter and Enclosure for California's 2004-2006 303(d) List letter from Ms. Alexis Straus to Mr. Thomas Howard, SWRCB, November 30.

U.S. EPA, 2004, Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-*p* Dioxin (TCDD) and Related Compounds National Academy Sciences (NAS) Review Draft.

U.S. EPA Region 5, 2003. RCRA Corrective Action Ecological Screening Levels, <<http://www.epa.gov/reg5rcra/ca/edql.htm>>.

U.S. EPA, 1993, "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria", October 1, 1993 by Martha G. Prothro, Acting Assistant Administrator for Water. Water Resource Center, USEPA, Mailcode RC4100 M. Street SW, Washington. D.C. 20460.

U.S. EPA, 1992, "Interim Guidance on Interpretation and Implementation of Aquatic Life Criteria for Metals" May, 1992. Office of Science and Technology Health and Ecological Criteria Division, Washington, D.C. 20460